SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING HELD AT THE INSTITUTE IN BOSTON MARCH 14, 1872.

The President, J. D. Runkle, in the chair.

Mr. S. Dana Hayes read an interesting paper on the history and manufacture of petroleum products. This industry, though less than twenty years old, has become one of great importance in this country, and petroleum and its products take a high rank among our exports.

The crude and refined petroleum exported from the United States in 1871, estimated at a low average value of twenty-five cents per gallon, amounted to nearly $35,000,000.

Mr Joshua Merrill, of the "Downer Kerosene Oil Company" of Boston, has done more perhaps than any one else to bring this new manufacture to its present advanced state.

THE FIRST COAL OIL

manufactured in this country was made by Mr. Atwood in Waltham, Mass. in 1852. This oil was used for lubricating purposes, and was made in connection with picric acid, benzole, and other products, from coal tar; 175,000 gallons of this oil were made, and it was considered as one of the best lubricating oils of that day. Its odor was very offensive, which, with several other comparatively poor qualities, would render it quite unmerchantable if compared with the neutral hydrocarbon lubricating oils of the present day.

It appears that some of the lighter coal tar products were used for illuminating purposes in this country as early as 1856, and it was found, upon the introduction of the Knapp and Deitz lamps, which were designed for burning resin and other oils, that some of the light hydrocarbons, obtained by Mr. Merrill from Trinidad bitumen, burned readily in them, giving a brighter and more beautiful light than the common animal oil lamps and candles.

The first attempt to produce lubricating oils from the Albert coal of New Brunswick was made in South Boston by Mr. Merrill early in 1857. By the autumn of that year he had six retorts, with a capacity of 1,200 pounds of coal each, in operation, producing 360 gallons of crude oil in twenty-four hours. The number of retorts was soon after increased to fifty, and the establishment then yielded at the rate of 900,000 gallons of crude or 650,000 gallons of refined oil per annum.

It was found that the first products of the distillation were several thin, light colored hydrocarbons which, being unfit for lubricating purposes, were considered valueless; and as considerable loss of material resulted from their production, attempts were made to prevent the decomposition which caused their appearance; but all endeavors in this direction only served to show that any distillation of these hydrocarbons is destructive; and as it was soon after discovered that these lighter hydrocarbons were valuable for illuminating purposes, further attempts were not made to prevent their production.

The lightest product of the distillation of the Albert coal was called "keroselene;" its specific gravity is only ·634, and boiling point, 85° Fah. It possesses remarkable anæsthetic properties, which have been utilized to some extent.

The production of illuminating oil from

PENNSYLVANIA PETROLEUM

was commenced in 1858, and in 1860 there were fifteen establishments in the United States engaged in this manufacture exclusively. After the introduction of petroleum, the use of Albert coal steadily diminished until 1865, when it was finally abandoned.

By distillation, petroleum breaks up into thin hydrocarbons even more readily than Albert coal, and the process may be so modified that the entire contents of the retort will be converted into illuminating or burning oils. By the present process of distillation, nine distinct commercial products are formed, as follows:

Name.	Spec. Grav.	Boiling Point.
Rhigolene	·625	65° Fah.
Gasolene	·665	120° "
C. Naphtha	·706	180° "
B. Naphtha	·724	220° "
A. Naphtha	·742	300° "
Kerosene oil	·804	350° "
Mineral sperm oil	·847	425° "
Neutral lubricating oil	·883	575° "
Paraffin	·848 (?)	575° "

Mr. Hayes exhibited specimens of these products before the Society.

RHIGOLENE

is the lightest of all known liquids, and it evaporates so rapidly at common temperatures as to reduce the temperature to 19° Fah. below zero in twenty seconds. It corresponds to the keroselene produced from Albert coal, and, like that, has been used as an anæsthetic in surgical operations; its value for this purpose is due to its rapid evaporation.

The most noticeable characteristic of the heavy lubricating oils produced from Albert coal and petroleum was their offensive odor, and though many experiments were made by various manufacturers, it was not until November, 1867 that any success attended the effort made to produce a neutral odorless lubricating oil. At this time, Mr. Merrill, partly as the result of an accident, succeeded in making a clear, nearly odorless, neutral oil. Subsequent experiments demonstrated that this desirable result was attained by employing a very moderate fire in the distillation, and withdrawing it gradually toward the close of the operation; thus removing all the light odorous hydrocarbons, without decomposition either of the distillate or the heavy oils remaining in the still.

This important discovery was secured by letters patent in this country and Europe, and the demand for these oils is steadily increasing. In 1871, 50,000 gallons were sent to England alone, where it was used for lubricating spindles, oiling wool, etc.

PARAFFIN

is one of the products of the destructive distillation of petroleum, and was made by Mr. Merrill in 1859, and since then he has made 50,000 pounds in a single month. Its principal uses are for making candles, waterproof fabrics, chewing gum, etc.; and a manufacturer of friction matches in New York has used 100,000 pounds in one year.

MINERAL SPERM OIL

is a heavy and perfectly safe illuminating oil, first made by Mr. Merrill while experimenting with paraffin oil in lamps; he produced it by subjecting the heavy paraffin oil to a partially destructive distillation, which, without sensibly increasing its volatility, made it less viscid, so that it would ascend the wicks freely, and still retain its character as a fixed oil.

This oil is comparatively inodorous and will not influence or give off an inflammable vapor at any temperature below 300° Fah.

Mr. Merrill estimates that the present yield of petroleum is sufficient for the production of 160,000 gallons of mineral sperm oil every day—a quantity double that of the whale and sperm oils obtained in the best days of whale fishing.

It costs at present somewhat more than common kerosene, but it burns more slowly and gives as bright a light, so that the actual cost of the light obtained is about the same; a single lamp, burning mineral sperm, costs one half cent per hour. Its perfect combustion requires more oxygen, and a different form of burner, as the Argand or Dual, is necessary; these burners are as cheap and as easily obtained as and others, being made by the same manufacturers.

Referring to the origin of petroleum, Mr. Hayes said the prediction made by the chemist Liebig, many years ago, that he should live to see the sunlight of past ages shining in his house, seems to be now practically realized for the whole civilized world.

That ancient sunlight has come down to us, stored up in the vast deposits of coal and petroleum.

He performed a number of interesting experiments to show the different degrees of inflammability possessed by the different petroleum products, and demonstrated that the ordinary kerosene now in use is but little safer than naphtha.

The mineral sperm was ignited with difficulty; and a burning torch was instantly extinguished, when plunged beneath the surface of this oil, without inflaming it.

A vote of thanks was tendered Mr. Hayes for his interesting communication. W. O. C.

VALUABLE PHOTOGRAPHIC IMPROVEMENT.

Among recent photographic improvements is the process of Colonel Stuart Wortley, of London, long distinguished as a scientific observer and amateur photographer.

Instead of the usual nitrate of silver bath, Colonel Wortley employs what is known as an emulsion. That is to say, he mixes with the usual collodion a few grains of nitrate of silver and also of nitrate of uranium. These substances give to the collodion a remarkable sensitiveness to light. In taking pictures, the operator simply pours the sensitized collodion upon the glass plate, and then rinses it in water. The plate is then ready for immediate use, or it may be kept, in a dark place of course, and used at convenience. The picture is readily developed by means of pyrogallic acid, ammonia, and bromide of potassium, and the finest pictures are produced with more certainty and much less trouble than by the ordinary process. A trial was recently made in London before a photographic committee, for the purpose of exhibiting the relative merits of the old and the new process, the latter being conducted by Colonel Wortley, and the former by Mr. Gordon, a celebrated photographer. Both parties used the same lenses. Repeated trials upon all sorts of pictures, outdoor views and gallery portraiture, revealed the fact that the new process was the best. It proved to be more sensitive than the wet process, finer pictures with less labor being the result.

Colonel Wortley promises soon to give us the exact formula by which he prepares his plates, when we shall place it before our readers. The process is attracting much attention abroad, and it would seem that the days of the wet bath and its troublesome paraphernalia are nearly ended.

THE HOLTZ ELECTRICAL MACHINE.

On page 380, Vol. XVI. of the SCIENTIFIC AMERICAN, we published an illustrated description of the Holtz electrical machine, the most powerful instrument known for generating frictional electricity. Sparks of unprecedented length are produced by this machine, with very small expenditure of power in operating it.

Mr. E. B. Benjamin, 10 Barclay street, New York, has just imported from Berlin an improved machine of the same kind, the largest yet made. It is destined for the University of Pennsylvania, and is said to be the most powerful electrical machine in the world. It was constructed under the supervision of Mr. Poggendorff, and has all the improvements devised by Holtz, Bokhardt, and other celebrated electricians and physicists.

When adjusted properly and working under favorable conditions, this machine gives a spark eighteen inches in length, with a loud detonation. The effects produced by this elegant specimen of scientific and mechanical skill are highly interesting, and it is a matter of congratulation that such an instrument is to remain in this country. The revolving plate of glass is thirty-four inches in diameter.

SCIENTIFIC AND PRACTICAL INFORMATION.

TREATY BETWEEN CHINA AND JAPAN.

There is at last a prospect that China, the most impenetrably conservative nation in the world, may yield somewhat to external influences, and allow the introduction, into her interior, of the productions of America and Europe. This hope is held out to us by the conclusion of a treaty between China and Japan, arranging the terms of commercial intercourse between the two countries, stipulating the conditions on which certain ports, to be afterwards selected, in each country shall be open to the commerce of the other, and appointing a system of arbitration for the settlement of disputes. In spite of the rigorous conditions under which the English have traded with the Chinese in the five treaty ports, Amoy, Ningpo, Shanghai, Foochow and Hong Kong, much good effect on the prejudices of the Orientals has been made by the traders there, and the opening of some more localities to similar influences, especially to a nation of the same branch of the human family, is likely to widen the beneficial result of that interchanged commerce which has already done so much, and which will in the future do more, for the cause of civilization.

RAMIE.

Our readers have been informed of the advantages to agriculture likely to result from the introduction of this fiber into our country, and many, if not all, will be interested in knowing that its cultivation in California has been entirely successful. Some cloths of great strength and delicacy of texture, possessing a high finish that is not usually seen except on silk goods, were recently exhibited at the California State fair, and attracted much attention. The farmers of the State are very anxiously making enquiries on the subject, and a company has been formed in San Francisco to promote the cultivation, and to give the necessary information to agriculturists. The great strength and fineness of this fiber give it a place among materials for textile manufactures which only silk can rival, and there must be many States in our extensive country in which the cultivation can be successfully carried on.

AN ABSCESS CURED BY INADVERTENCE.

Dr. Du Hadway reports the singular restoration to health of a man afflicted with a psoriatic abscess. The Dr. tried several remedies without success, and at last prescribed two drams iodide of potassium in six ounces distilled water; dose, a tablespoonful three times a day. The patient, a foreigner, misunderstood the directions, and swallowed the whole at once. Strangely enough, the 120 grains iodide of potassium did him no harm; but, on the contrary, his appetite, which had been very poor, was restored, and in ten days the abscess was healed. He needed no further medicine, and is completely restored to health.

WEIGHT OF WROUGHT IRON AND STEEL.

Many of our readers, who send us inquiries as to the weight of wrought iron and steel of different sections will find the following formulæ useful: The weight of a bar of round iron is the square of the diameter in inches × the length in feet × 2·63. The product shows the weight in pounds avoirdupois. The weight of a bar of iron of any section is the area of the cross section in inches × the length in feet × 3·36; and the product also shows the weight in pounds. For round steel bars, change the constant factor from 2·63 to 2·67, and proceed as for round iron bars. For steel bars of other sections, substitute 3·4 for 3·36, the other factors remaining the same as for wrought iron bars.

FRICTION GEARING.

We commence this week a series of able articles upon Friction Gearing, a subject which is of great and increasing mechanical importance. The use of this kind of gearing has proved very economical and satisfactory for many kinds of work, and our readers will receive with interest the theoretical and practical information contained in these contributions. They are from the pen of an able engineer, Mr. E. S. Wicklin, of Black River Falls, Wis., who has had a large experience, in designing and constructing this class of gearing, in the western lumber mills.

WE are indebted to E. Furse, banker, No. 9 Piazza di Spagna, Rome, Italy, for specimens of asbestos wall paper, and plain thick paper for enveloping books, valuable papers, and choice goods. Mr. Furse would like to introduce the article into this country if he can negotiate with reliable parties.

ANTS ON PEACH TREES.—A writer in the Boston *Cultivator* says that in his experience he has been led to look upon the black ant as his best friend in the peach orchard, his only object in traveling up and down the tree being to destroy lice, which frequently cover the young and tender leaves of the peach tree.

A CANDLE TO BURN ALL NIGHT.—When, as in case of sickness, a dull light is wished, or when matches are mislaid, put powdered salt on the candle till it reaches the black part of the wick. In this way a mild and steady light may be kept thruogh the night by a small piece of candle.

TO PRESERVE CLOTHES PINS.—Clothes pins boiled a few moments and quickly dried, once or twice a month, become more flexible and durable. Clothes lines will last longer and keep in better order for wash-day service, if occasionally treated in the same way.